

EXHIBIT N-

PART 1

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January 31, 2006

Regarding: "Vargas v. Pfizer, Inc. et al., SDNY Cause No. 04-CV-9772 (WHP) - Expert opinion and FFT Analysis"

Dear Brian,

Thank you for contacting me and requesting that I provide you with my expert opinion as to whether your drum loop *Aparthenonia* is a copy of, or is based on a digital manipulation of, the plaintiff's work, "Funky Drummer II." Although I have never previously served as an expert witness by deposition or at trial in a case such as this, I believe that I am particularly qualified to provide you with a definitive comparative analysis of the two works. I base this belief on my unique experience and expertise in the area of Computer Music, Digital Sampling, Synthesis, Sound Design, and Digital Signal Processing, plus my work and publications associated with the premiere research tool for Computer Music – Csound; and especially my PhD. dissertation research in FFT-based Digital Signal Analysis and Resynthesis.

I have attached a copy of my resumé to further support my expertise and elaborate some on my extensive background by outlining some additional experience and credentials. I will provide a list of my publications under separate cover, but I note here that I am regarded internationally as one of the world's leading computer music composers, performers, researchers and teachers and I have edited and written the definitive textbook in the field – **The Csound Book** – published by MIT Press that is used to teach musicians, engineers, and computer scientists, the fundamentals of digital signal processing at universities and conservatories around the world. Furthermore, I have another defining textbook in the works for MIT Press that will be released in the winter of 2007 – **The Audio Programming Book** that teaches how to write the software and create the tools required to do the computer analysis that you have requested of me. I also have twenty years of teaching experience at the world's premiere conservatory of contemporary music recording and production – *The Berklee College of Music* in Boston; five years of research at one of the world's leading research labs – The Center for Music *Experiment* at UC San Diego; twenty-five years of work and extensive collaboration with the "father of computer music" Dr. Max Mathews at both *Bell Laboratories* and *Stanford University*; twenty-one years of work on *Csound: The Universal Software Synthesis and Signal Processing Language* with computer music pioneer – Dr. Barry Vercoe, at the MIT Media Lab in Boston; computer music research at *IBM* in New York (resulting in several patents) and *Interval Research* in California (resulting in several new synthesis technologies and patents).

In preparing this report, I relied primarily on the .mp3 files *Aparthenonia* and *Funky Drummer II* that you provided me. I also reviewed the following documents for background on the case:

* **Plaintiffs' Second Amended complaint**
* **Defendant's 6/30/05 memorandum in support of defendants' motion for summary judgment and supporting documentation (including Ricigliano, Moody and Transeau declarations with attachments)**
* **7/22/05 Plaintiffs' Opposition to summary judgment (including Rodriguez and Ritter declarations)**
* **10/26/05 Order on summary judgment motion**

My compensation for this assignment is under discussion and has not yet been finally determined.

To do my comparative analysis of the two drum-loops, I used specialized Fast Fourier Transform (FFT-based) spectral analysis algorithms from the following three digital audio research editing/processing/visualization tools for the Macintosh computer: *Spear*, *WaveSurfer*, and *Audacity*. A Fourier-Transform converts a time-domain representation/display (as illustrated by waveform analysis) of a sound (the physical pressure wave that we *experience*) into a frequency-domain representation (showing the unique timbre, spectrum, "color") of a sound (the unique frequency signature of a sound that we *perceive*). Thus, an FFT Analysis will reveal those characteristic features of a sound that define it as being unique. FFT-analysis is the equivalent of DNA testing for audio. The tool itself functions as a *sonic microscope*. It reveals, documents, and details all the hidden inner complexity that give every sound its unique fingerprint and individuality. Whereas a waveform analysis provides us with a useful general composite view of the rhythm and overall amplitude of a combined sound event, an FFT analysis will separate out all the components in a complex sound event and show how they evolve in time and contribute to make up the sound that we identify as unique. (Fourier was the French mathematician who proved that any complex sound could be deconstructed and reconstructed via a sum of harmonics (or sine waves). His mathematical model parallels how the cochlea in the inner ear translates the physical pressure wave that moves the eardrum, into discrete frequencies that stimulate particular receptors along the cochlea that are transmitted and mapped in the brain as multi-dimensional spectral images – what the Fourier Transform does on a computer very closely models what happens in our inner ear and in our brains. I like to explain it to my students as follows – We *experience* sound in the Time-Domain (waveform view), but we *perceive* sound in the Frequency-Domain (Fourier view). Whereas, a waveform analysis can be used to show that these two rather commonplace and mundane drum patterns at issue here might have some similarities, an FFT analysis will show us that the sounds that constitute these two drum loops are totally unique. A carefully tuned and equivalently set FFT-Analysis will reveal the unique DNA of any and every sound.

To show the actual tone-colors and timbres, I used a *Sonogram-view* an *FFT-view* and a *Frequency Analysis* view. The sonogram will be used to compare the one-bar patterns over time with the *X-axis* showing spectral evolution over *time* and the *Y-axis* showing the unique *frequency* content as it evolves over time. The Fourier-view will represent *frequency* on the *X-axis* and show the detailed number of harmonics, and the *amplitude* of these frequency components on the *Y-axis*. The Frequency Analysis view shows an overall unique visual contour in which the *X-axis* represents frequency, and the *Y-axis* represent amplitude. Thus, differences in the overall shapes or contours correspond to differences in the sound. Numerical output of the analysis will also show that "the numbers" – which show amplitude, frequency, and analysis band are very different – and thus so too are the sounds. I have also done some Pitch-tracking, which shows that the pitches of the percussions instruments are unique as well. Finally, isolating individual beats and comparing them, shows that in general, there is a great deal "more" spectral information in Brian Transeau's drum-loop and thus more unique content as well.

The process I used is as follows. I converted the .mp3 version of each drum-loop into a more professional .aif format. Then I isolated one bar of each drumloop. Then I split the stereo files into mono files and analyzed the same single channel from each file. Then I edited out and isolated individual beats for more detailed comparison. Once these source materials were prepared for analysis I create the following tables:

1. The first view is a complete sonograms of each file using *WaveSurfer* which produces a grey-scale composites whose shading illustrates the unique amplitude of each spectral component/band (Figure 1)
2. The second set of figures (Figures 2 – 5) use *WaveSurfer's* spectral and waveform views to compare individual beats of both works.
3. The third set of figures (Figures 6 – 11) use *Spear* to view the entire 1-bar pattern of both works and use frequency lines to clearly indicate the unique life, death and trajectory of each frequency/spectral component over time.
4. Figures 12 and 13 show some of the data analysis from *Spear* which indicates that the partials that constitute each .mpe file are themselves unique in number, duration, and size.
5. Figure 14 shows the setting used in *Spear* to do the analysis and result in this data set.
6. Figures 15 – 22 use *Spear's* sonogram view to show and compare the unique contours of the lower frequency

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components of individual beats in each .mp3 file.

7. Figure 23 uses the program *Audacity* to superimpose the Waveform and Sonogram views of the entire 1-bar loop of both .mpe files. Note the unique shading and streaks in each that indicate unique frequency content.
8. Figure 24 uses *Audacity* to superimpose the Waveform and Pitch Analysis views of the entire 1-bar loop of both files. Although faint, you can see that there is unique pitch content in each of these soundfiles.
9. Figures 25 and 26 use *enhanced autocorrelation* in *Audacity* (which builds up dynamic multiple bandpass-bandreject filters that pass frequencies with continuous energy and reject frequencies without continuous energy and therefore allows the pitch to pass freely while blocking the hiss, clicks, and ticks of the drums and thus allowing us to better isolate, focus upon and compare the unique pitch-content of each of the one-bar drumloops. Clearly they are unique and show unique overall pitch content.
10. Figures 27 and 28 are text outputs of the actual numerical data used to draw the plots shown in figures 25 and 26. In the three columns, we see the time, frequency, and amplitude of each spectral component. Comparing the same time point in figure 27 to that time point in figure 28 will reveal a difference in amplitude and thus show that they are unique. Likewise, comparing the same frequency values will show that they appear at unique timings and have unique amplitudes and are thus unique.
11. Finally, figures 29 – 36 use *Audacity* to do a comparative frequency analysis of each beat of the two soundfiles. These unique overall shapes (referred to as their spectral envelopes or signatures) show unique and different spectral content for each beat of each soundfile.

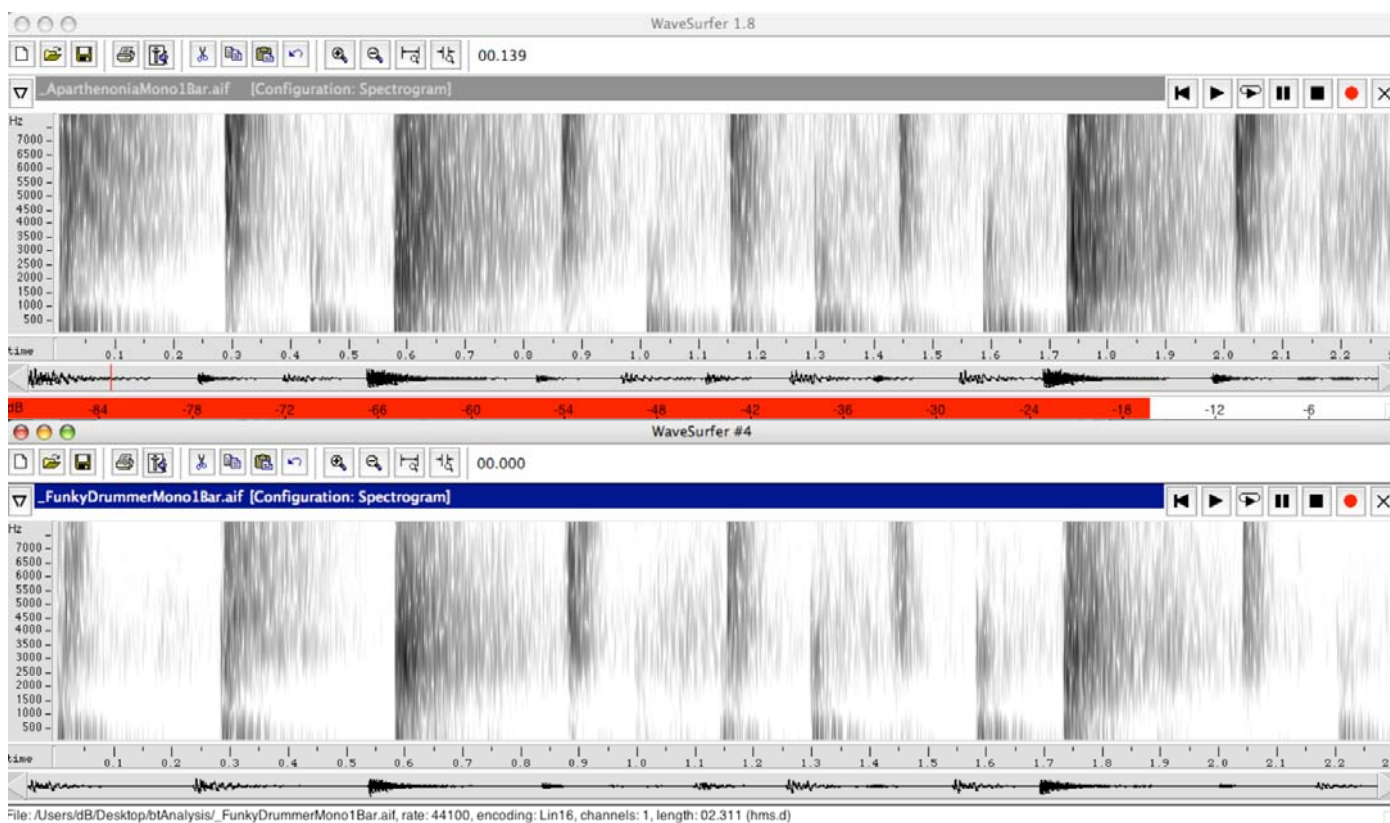


Fig1. WaveSurfer Spectrum of 1-bar loop (Aparthenonia on top, Funky Drummer on bottom – Note Different Spectral Content)

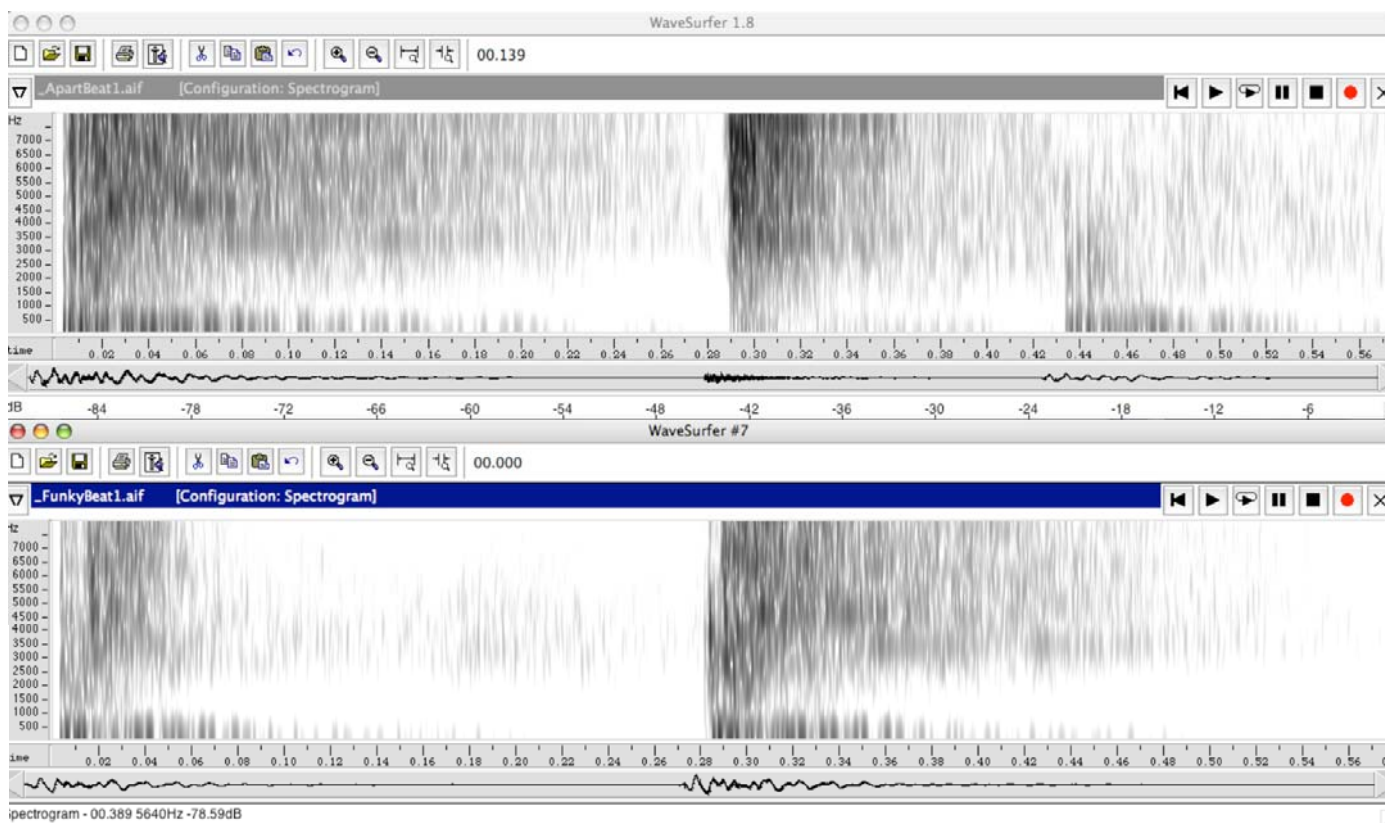


Fig2. WaveSurfer Spectrum of beat 1 (Aparthenonia on top, Funky Drummer on bottom – Note Different Spectral Content)

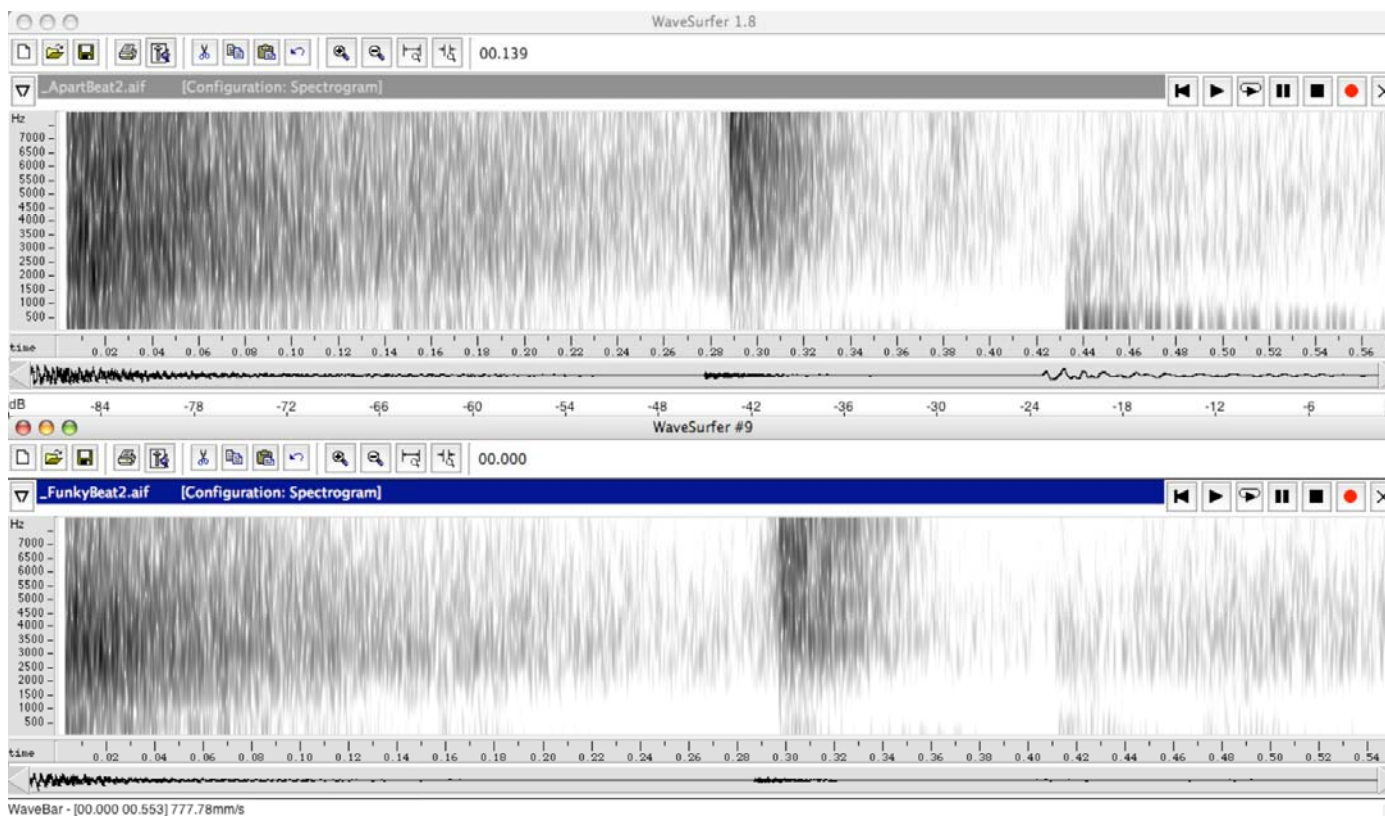


Fig3. WaveSurfer Spectrum of beat 2 (Aparthenonia on top, Funky Drummer on bottom – Note Different Spectral Content)

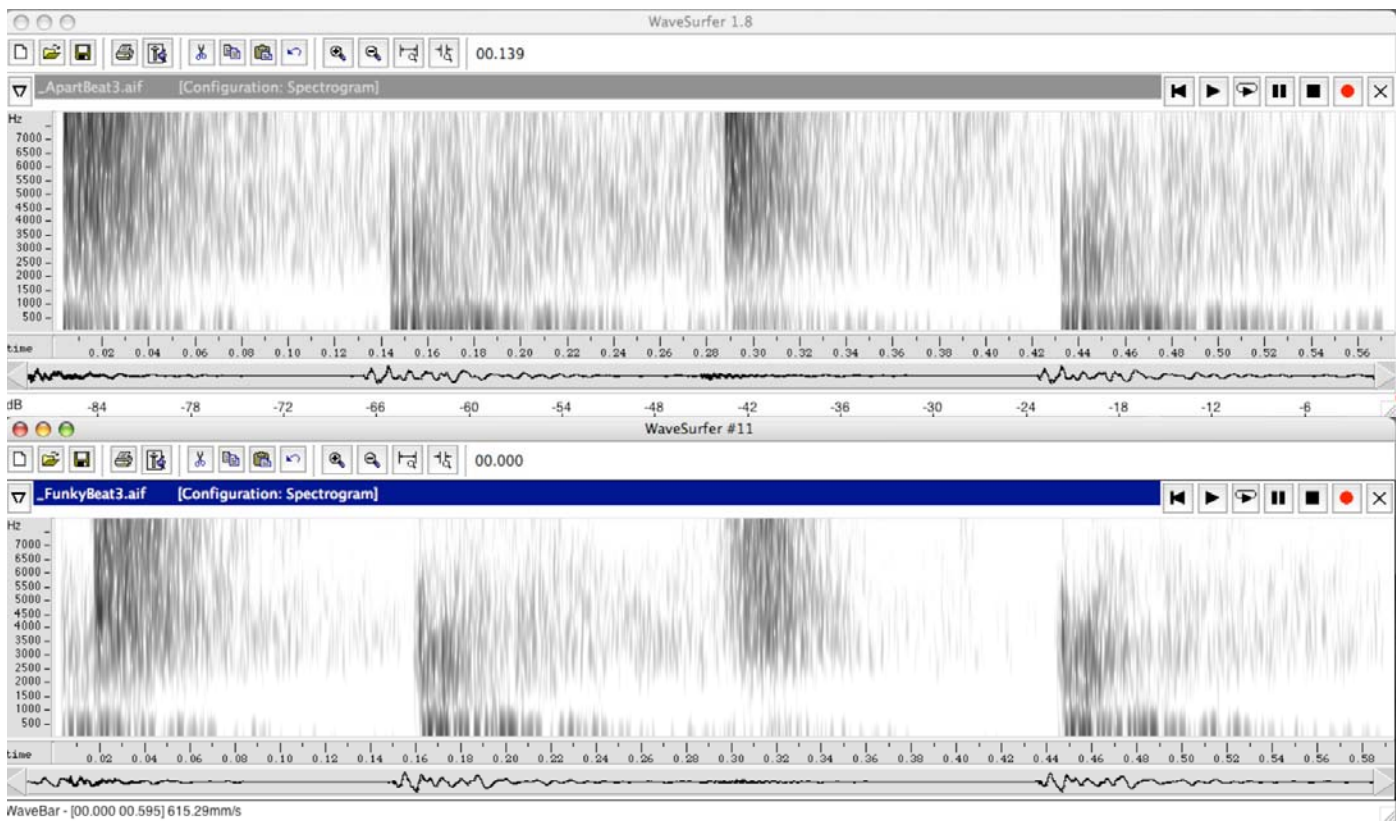


Fig4. WaveSurfer Spectrum of beat 3 (Aparthenonia on top, Funky Drummer on bottom – Note Different Spectral Content)

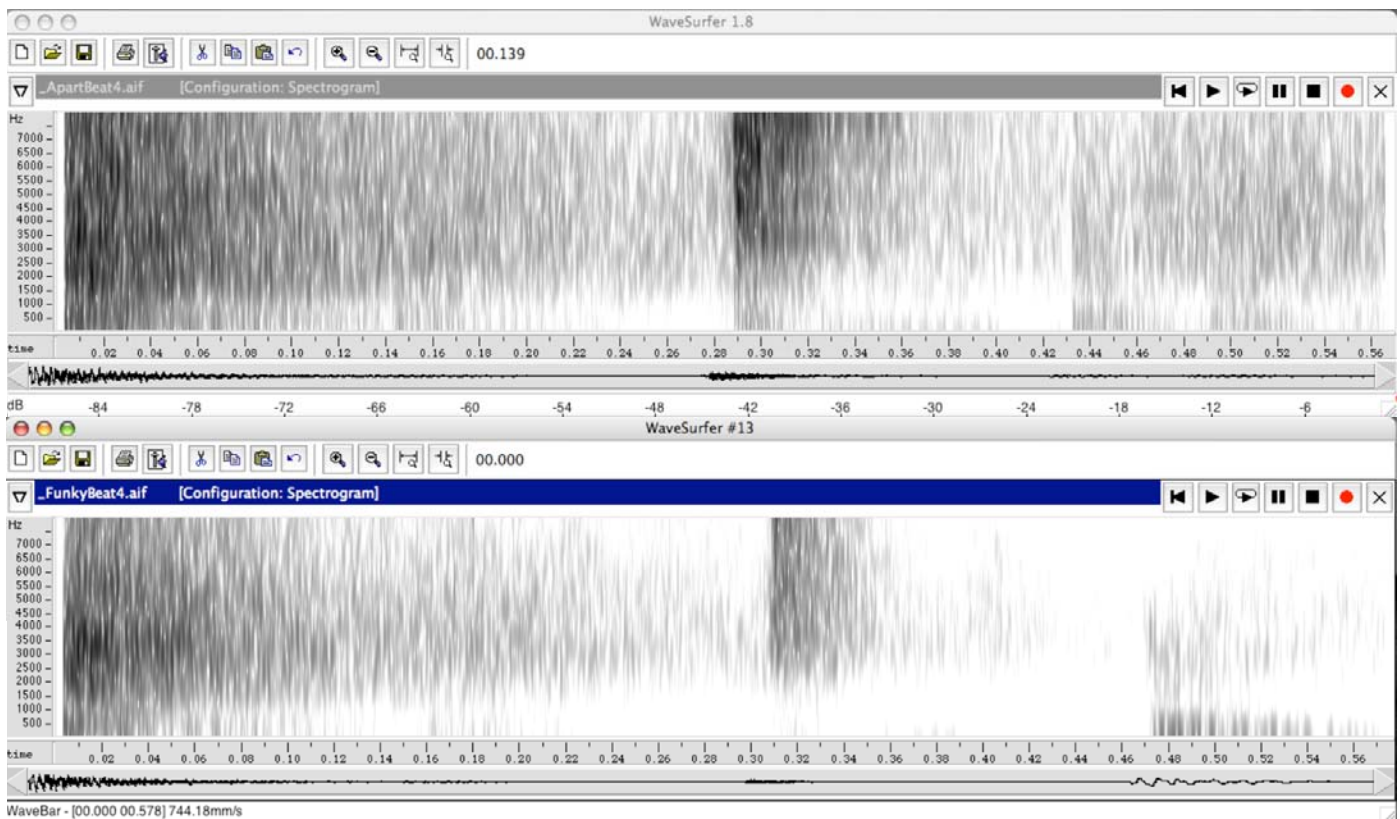


Fig5. WaveSurfer Spectrum of beat 4 (Aparthenonia on top, Funky Drummer on bottom – Note Different Spectral Content)

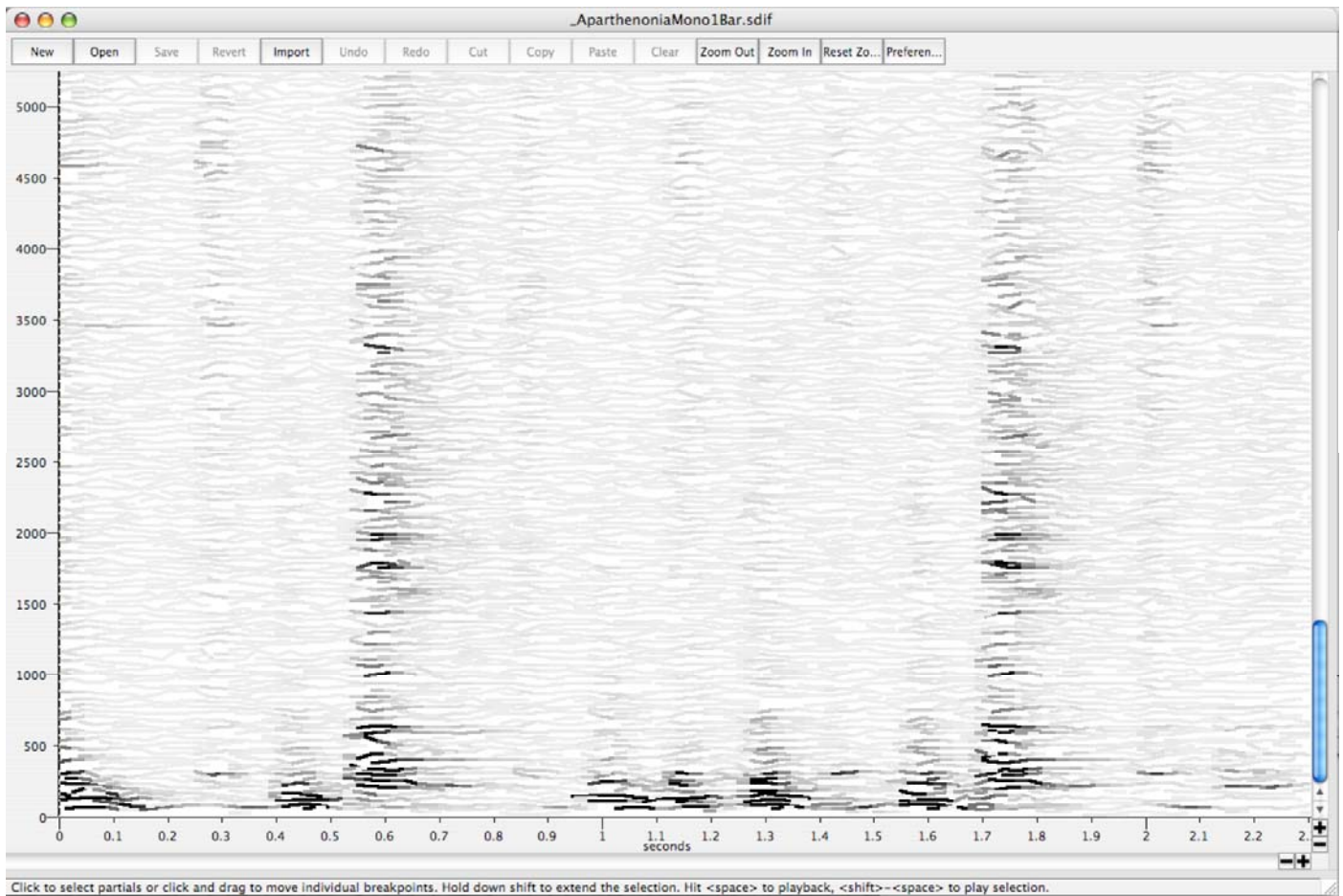


Fig6. *Spear* Sonogram 1-bar Loop (Aparthenonia Lower Frequency Content)

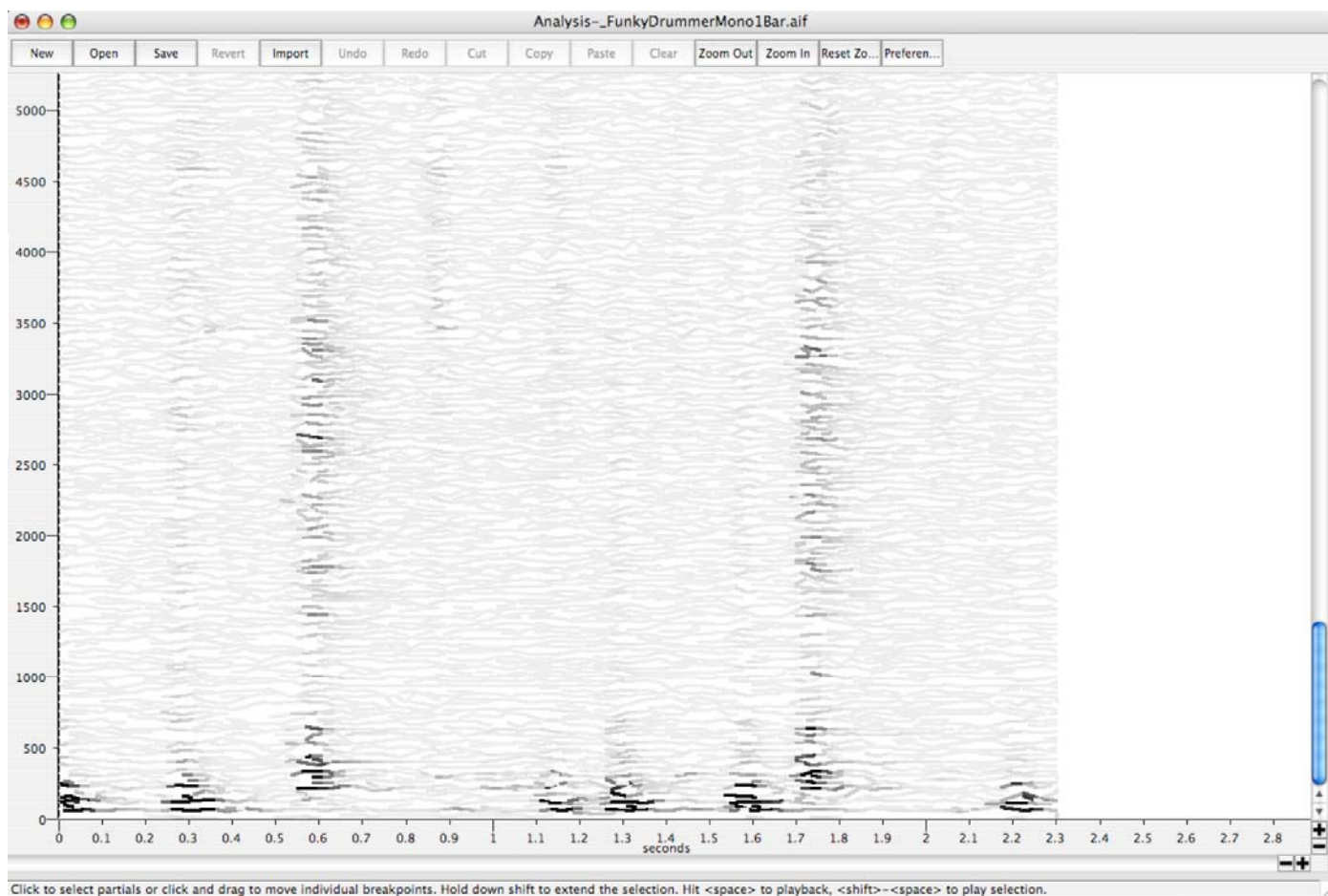


Fig7. *Spear* Sonogram 1-bar Loop (Funky Drummer Lower Frequency Content)

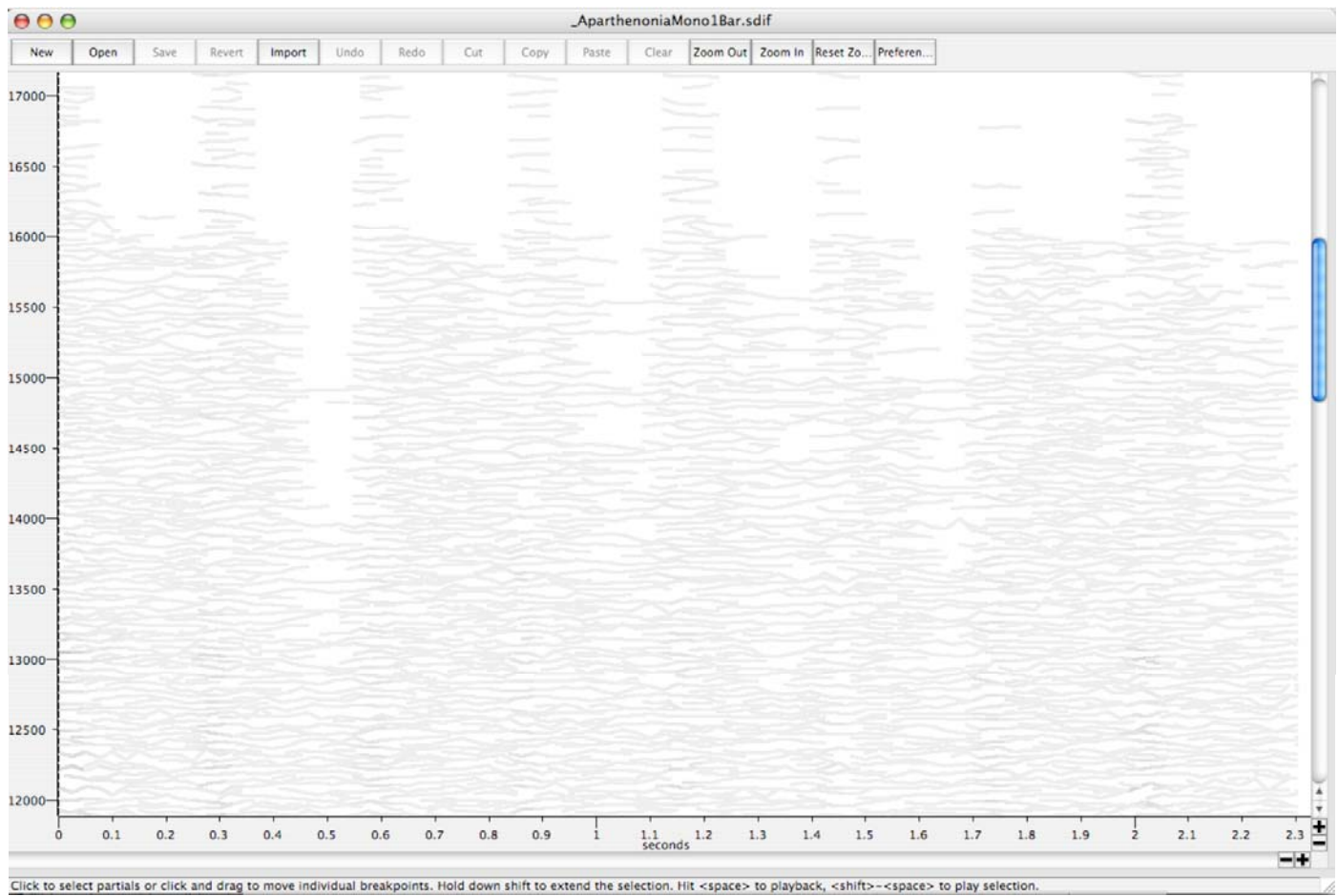


Fig8. *Spear* Sonogram 1-bar Loop (*Aparthenonia* Mid-High Frequency Content)

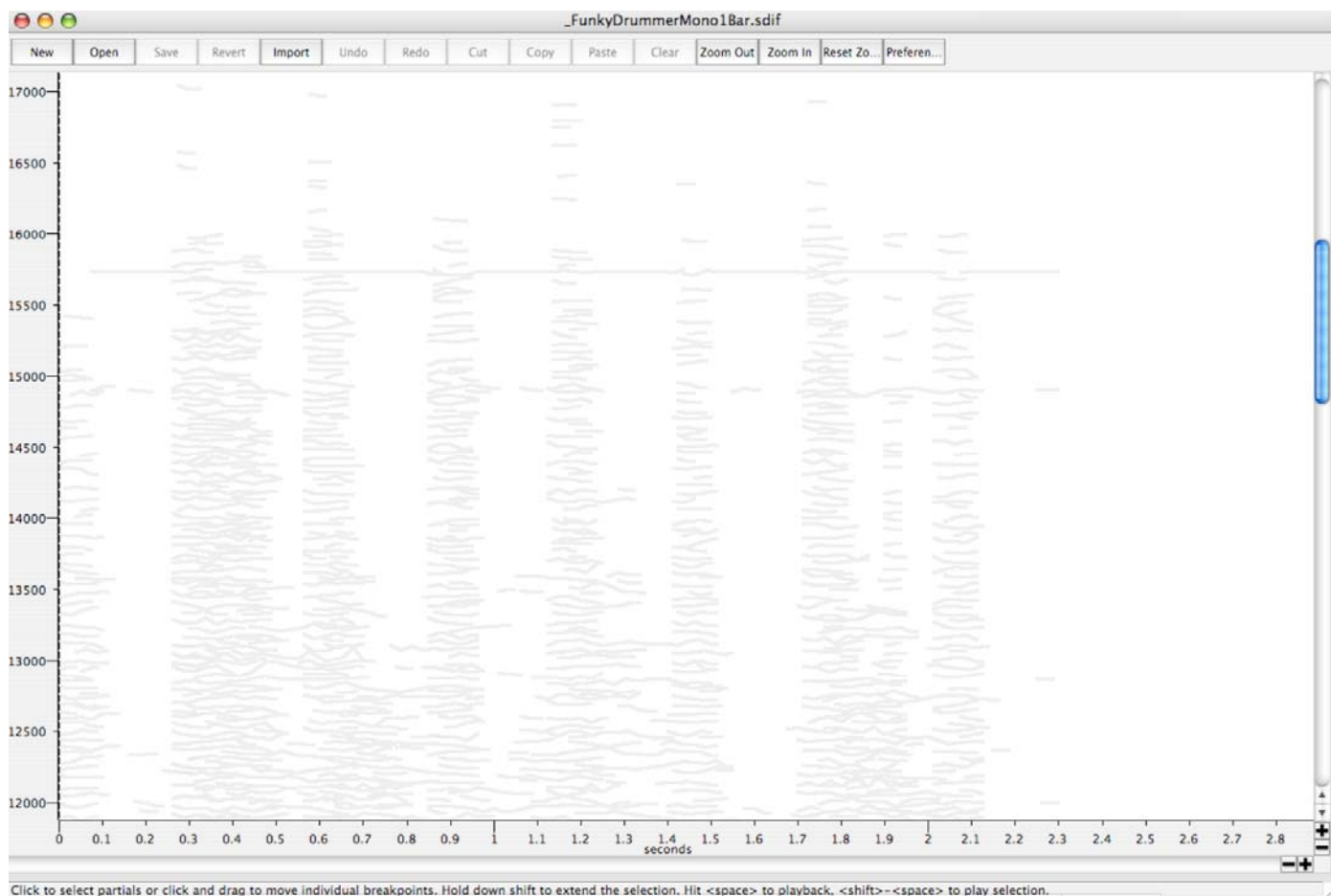


Fig9. *Spear* Sonogram 1-bar Loop (Funky Drummer Mid-High Frequency Content)

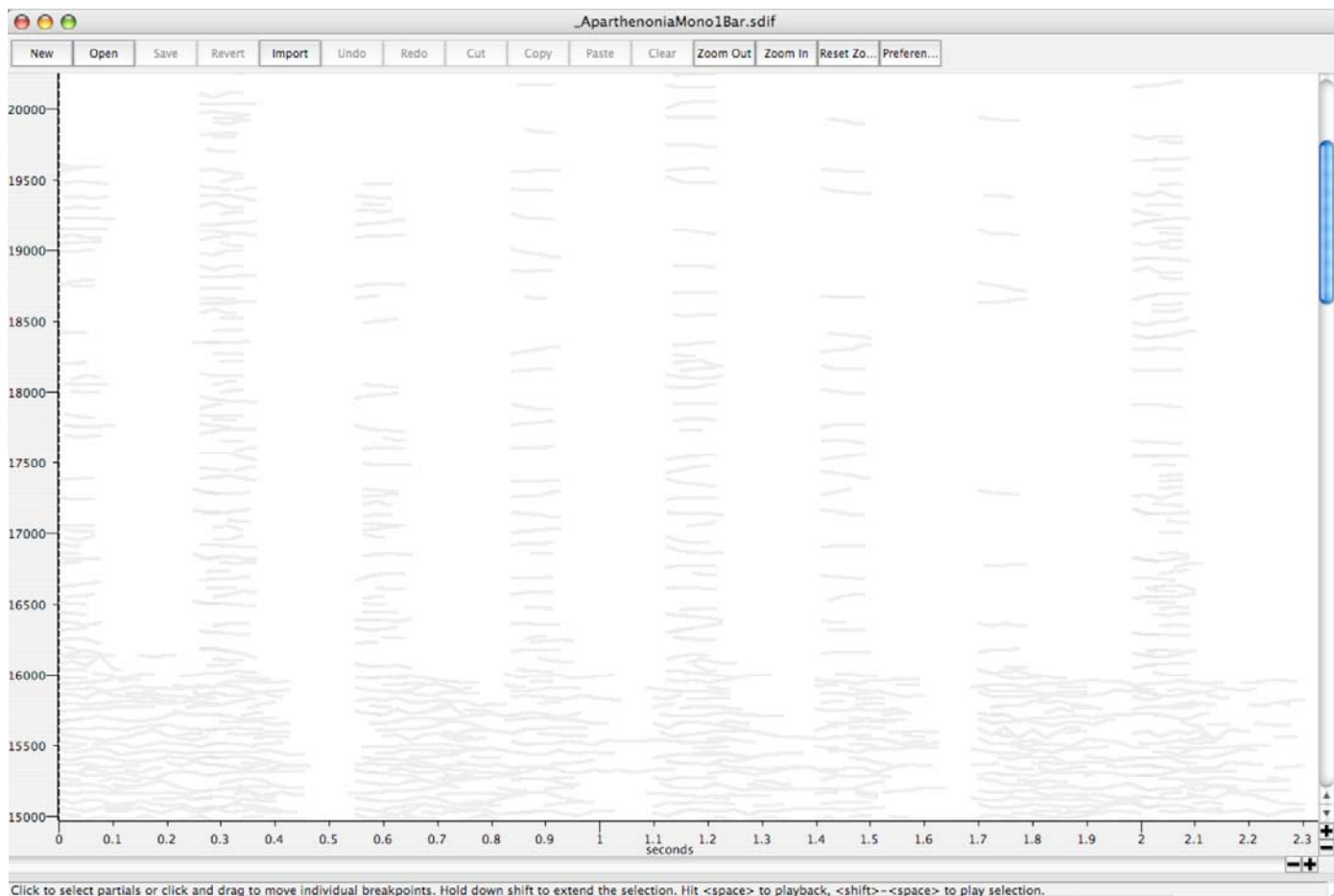


Fig10. *Spear* Sonogram 1-bar Loop (Aparthenonia High Frequency Content)